Natural Cure for Rupture

A RATIONAL, NATURAL MEANS OF PERMANENTLY CURING RUPTURE

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BY SAME AUTHOR
Virile Powers of Superb Manhood, Power and Beauty of Superb Womanhood, Macfadden's New Hair Culture, Strength from Eating, Strong Eyes, Macfadden's Physical Training

PUBLISHED BY
PHYSICAL CULTURE PUBLISHING CO.

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Yours for Health
Bernarr Macfadden

PREFACE.

Rupture curable!

Many will no doubt think this an astounding statement, especially when the cure is effected by simple means without the aid of surgery. I have known for many years that rupture can be avoided by merely strengthening the cords, muscles and other tissues in the abdominal region, but it is only recently; that is, within the last three years, that I have given any particular attention to the study of natural means of curing this defect. I can truly say that, after giving the matter considerable attention, the apparent simplicity and reasonableness of a cure by these means astounded me, and I believe it will appeal in a similar way to every one who will carefully

consider the conclusions set forth in this book.

I know that in a number of cases the trouble is of such serious nature that the chances of recovery will be extremely small. Where the rupture has existed for a long time, and the opening allowed to increase to a large size, a cure can rarely be effected. But I firmly believe that the average person suffering from this trouble, where the opening is not too large, can be cured absolutely in from three to six months by following out the instructions found in this book.

Of course, the theories advanced herein were very firmly believed in for some time before I had an opportunity to test their value.

In March, 1901, during the time we opened our Health Home, Mr. Alexander Axelson, the free consumptive patient we accepted and cured, was suffering from a

double inguinal hernia. I saw that here was a chance to test the theories that I long held for the cure of this trouble, and to show how effectively his case was cured I will quote a few words of his letter, received about five months after treatment was begun:

> The rupture has been entirely cured now, and have worn no support for some time.
>
> A. Axelson, Port Byron, Ill.
>
> July 27, 1901.

I would advise even very serious cases to give the treatment found herein a trial, as it will at least build increased physical health, even should it fail to effect an entire cure.

The ruptured man or woman is a cripple. Not only crippled physically, but this defect, to a certain extent, influences one's mental condition. To be compelled to continually wear a truss is

not only inconvenient, but in many cases is it extremely painful; and furthermore, one is constantly worried by the fear not only that the rupture may come down, but that it will grow more serious in character. Of course, I must say at the very outset that the method here advanced is not easy. You will have to work hard for a cure. You will have to deny yourself food—will have to go hungry. In many cases you may feel that you are being half starved, but the cure, I am satisfied, will be considered worth a thousand times the sacrifices necessary in bringing it about.

Bernarr Macfadden

CHAPTER I.

DIFFERENT KINDS AND SIGNS OF RUPTURE.

The importance of being able to distinguish accurately the symptoms of rupture can hardly be overestimated. Though this book is written more particularly for those who are attempting to cure a trouble of this nature, a brief description of the symptoms of the various kinds of rupture are herewith given.

The classification of hernias by medical and surgical writers is extensive. They recognize various kinds of hernia. The reader, however, may have a comprehensive knowledge of these varieties, through the following subdivisions, in which the hernias are classified according to location and character.

Classified according to location, there

are five kinds of hernia, viz.: Inguinal, Scrotal, Femoral, Umbilical and Ventral hernia.

In Inguinal hernia the protrusion of bowel or other matter, is through the internal abdominal ring, into the inguinal canal in the groin, and in its course it follows the spermatic cord in males, or the round ligament of the womb in females. It prevails more among males than females, and occurs oftener in the right side than the left.

Scrotal hernia: Inguinal hernia, after a time forces itself into the scrotum of the male, often distending it to enormous size. It is dangerous when it reaches this stage, as it is then generally all but impossible to return the hernia to the bowel cavity without surgical assistance.

Femoral hernia: This is a form of hernia in which the protusion passes through a very small opening at the front

of the abdominal wall; it is confined generally to women, and if taken in time is easily reducible, and may be completely overcome by proper systematic exercising.

Umbilical and Ventral hernias: Umbilical hernia occurs at the navel, or umbilicus, and is encountered more frequently among women than among men. It is liable especially to attack elderly, corpulent ladies, or those who have borne many children, and have weakened the abdominal walls by corset wearing, or other unhygienic method of clothing. It also occurs frequently among new born infants, where there is defective, or weakened condition of the abdominal walls; and violent coughing, sneezing or crying will suffice to produce it. It generally appears not larger than the tip of the finger, but if neglected will speedily develop until it becomes very large and pendulous.

It is necessary for the reader here to be made familiar with the three varieties of hernia, as distinguished from each other by their character. Under these three heads all hernias are classified. They are known as reducible, irreducible and strangulated.

A hernia is reducible, when with a little care in manipulation the tumor may be forced back into the abdominal cavity through the orifice by which it descended.

It is irreducible when the mass of protruding bowel, etc., cannot be returned to the abdominal cavity through the opening it escaped by. This condition is encountered where a hernia has long been neglected.

When a hernia occurs, only the outer, muscular walls of the abdomen break, or split, and the pressure of the viscera forces the bowel through the opening, and along with it, the peritoneum, or inside lining

of the abdominal cavity, is stretched to the size and shape of the tumor. If allowed to remain long without reduction, this peritoneal sac grows fast to the walls of the skin, and reduction, without an operation becomes an impossibility.

Strangulated hernia is one in which the free circulation in the protruding bowel becomes impossible. It only occurs in irreducible hernias. When the opening is small, and there is a little local inflammation, the circulation is stopped in the protruding loop of intestine, and the gravest results are imminent, and if prompt relief is not afforded, it is almost certain to end fatally. As this is the gravest condition encountered in the treatment of hernia, one should carefully note the symptoms, and be prepared to act promptly when the condition becomes manifest. Pain and tenderness are experienced in the tumor, sometimes extend-

ing even throughout the entire abdomen, and easily mistaken for symptoms of colic; the bowels become constipated; nausea and vomiting follow, the abdomen swells, and fever develops.

The symptoms of hernia are such that there is not much chance of being deceived as to its character. Generally the hernia is plainly visible at the groin or umbilicus. Its appearance is accompanied by pain, soreness in and about the protusion, and, sometimes, nausea accompanies these symptoms. If the hernia is reducible upon the patient assuming a reclining position it can easily be pressed back into the abdomen. The few cases where hernia might be mistaken for varicocele or hydrocele hardly need specific notice here. A varicocele may easily be distinguished from a hernia by placing the patient on his back, pressing against the scrotum until the swelling is reduced,

then, while pressure is directed firmly against the abdominal ring have the patient rise. If it is a hernia, the tumor will not appear as long as the pressure is kept up; but if a varicocele, the pressure prevents return of blood to the trunk, and the veins swell.

In this connection it is well for the patient to know how to properly care for the various forms of hernia that he may suffer from. This direction is intended in the way of a first aid, and the course of treatment set forth in the following pages should be taken up promptly and pursued thoroughly.

As soon as aware that a hernia exists, the first effort should be directed toward its reduction. The patient should at once visit an expert, but if this is impossible, he should place himself on his back, with feet slightly higher than head, and by pressing upon the tumor endeavor to get it

back into the cavity. If it goes back easily, it should be secured there with a proper truss, and then the systematic body building set forth further on, entered upon.

If the hernia is in the groin, and it cannot be readily reduced by pressure applied by the hands, it may sometimes be done by the following method: Clasp the hands over the knee on the side the hernia is on, pull the thigh up firmly against the abdomen, and then pull it across the abdomen towards the opposite side. If this does not succeed, stop eating entirely for a few days, lie with feet higher than head, and apply cold wet compress to affected locality.

If the hernia has reached the strangulated form a physician should be immediately called. An absolute fast, hot water compress, followed by the manipulations described above, will in most cases be effective remedial agents.

CHAPTER II.

CAUSE OF RUPTURE.

Rupture, or hernia, is an unnatural protrusion of the bowels or their attachments from the body. This protrusion may be through either natural or accidental openings in the internal muscular coverings, or walls, of the abdomen. It may occur in any part of the abdominal region not covered by bone, though it usually appears in the region of the groin. Though the immediate cause of rupture may be some violent exercise, such as running, jumping, lifting, the weakened condition of the abdominal region is the condition that makes rupture possible. Sometimes this region becomes so debilitated that even coughing or sneezing will produce a rupture. The

peritoneum, or inner covering of the abdominal region, is provided with various openings for the passage of the nerves and blood vessels, and these openings are naturally only large enough to allow their passage, but when adjacent parts of the body have been greatly weakened by disuse, a rupture can easily be produced, thus allowing part of the abdominal contents to protrude.

Surgery is frequently used as a means of remedying hernia. It is dangerous, however, and in many cases does not result in a permanent cure, because abdominal weakness, the original cause of rupture, still exists, and although that particular opening may have been closed, another is liable to be produced at any time if this weakened condition continues.

Owing to the fact that exercises of a more violent nature are taken by males than females, and to the difference in the

construction of the abdominal parts, males are more subject to rupture than females.

There is less tendency to this trouble in children than there is in adults, for the particular reason that children are active in their habits, and the parts are so strengthened that the liability to rupture is reduced to a minimum.

One authority states that in children of one or two years, one out of thirty-one are afflicted. The affliction decreases in frequency up to the age of fifteen, when about one out of twenty-five are ruptured. Then again increasing in frequency so that at the age of twenty-one, one out of about twenty-one. At the age of forty, one out of about nine. At the age of fifty, one out of about six. At the age of seventy, one out of every three. Thus, it is clearly shown that rupture increases in the same ratio as the general use of the muscular system decreases.

NATURAL CURE FOR RUPTURE.

All authorities on rupture lay special stress upon the various direct causes of the trouble, and practically seem to entirely ignore the fact that abdominal weakness makes it possible. If the abdominal regions are strengthened as they should be, there is not the slightest danger of rupture, and all those who have so far escaped this trouble and are desirous of retaining their normal condition, must give especial attention to those means necessary in strengthening this important part of the body.

CHAPTER III.

THEORY OF CURE.

Throughout the entire animal world there is no species outside of man wherein there occurs even rare cases of hernia or rupture. The active life which other animals are compelled to lead develops these parts of the body and so strengthens them that, regardless of conditions, it is almost impossible for a rupture to be produced. Severe falls of all kinds, in fact, accidents which anyone might suppose would cause rupture, were it within the bounds of possibility, seem to be incapable of producing it. It is perfectly right and natural that man, the higher animal, should possess similar strength of those parts. The weakness and general physical deficiency seen in the

higher animal, man, is clearly the result of plain causes. Being an upright animal there is but little need for the muscles of the abdominal region unless active exercise is regularly indulged. As a result, all those muscles gradually grow weaker after childhood, and in many cases they become mere ribbons, instead of assuming that thickness and strength which nature clearly intended.

It is easy to understand how the tendons, muscles, cartilages and other supports of the abdominal contents become so weakened under such circumstances that violent exercise of almost any kind is liable to produce rupture.

The slightest activity requires a certain amount of use of the abdominal region of nearly all lower animals, and this to a large extent accounts for the superior strength which they possess in those parts.

Now, every one is aware that a weak arm can be developed and made stronger by proper use. I have personally seen men from forty to fifty years of age add from one to two inches to the circumference of their upper arms in a short time, by diligent practice.

Now, the muscles, tendons, cartilages and other parts of the body in the abdominal region are susceptible to improvement in strength, vigor and size to a similar extent with the arm. I maintain with all possible emphasis, that not only can one, by certain special exercises of the museles, so strengthen the abdominal region that rupture is practically impossible, but that rupture, if not of too long standing, and not too large, can, by the same means, be gradually remedied. As the supports of the abdominal contents, the muscles, tendons, ete., gradually grow in size, their improvement in strength vastly influences

all adjaeent parts to improve to a similar degree. The natural openings for the nerves, blood vessels, etc., from the abdominal region, become firmer and stronger. If rupture has actually lacerated the peritoneum and produced an opening in the lining of the abdomen it will make but little differenee, for it is not this membrane which holds the abdominal contents. It is the museles, tendons and other more vigorous parts, and if the abdominal eontents are properly held by a truss, whieh will not tend to enlarge the opening, this gradual increase in the size of these various parts will slowly but surely fill in the part where the rupture has been produeed, and if the strength is gradually increased and the exercises we recommended are continued, these defective parts will become so strong that there is no possible chance for a rupture to again appear.

As previously explained, the use of these muscles, by accelerating the circulation, not only strengthens the muscles themselves, but it increases the strength, size and thickness of every part of the adjacent tissue.

CHAPTER IV.

HOW TO BEGIN TREATMENT.

In remedying a trouble of this nature by natural means, one must prepare for hard work. It requires determination, persistence and close attention to every suggestion made herein. Remember that if the opening from which the bowels protrude is very large, but little hope can be given, though it would be well to give the treatment a trial, as under such circumstances a cure is far more desirable. Also remember that great weakness of these parts usually exists when the opening is large, and far greater caution in beginning the treatment is necessary.

The first step, as a means of enabling one to start the exercise, is to lessen the

quantity of food taken. If you are in the habit of eating three meals, only eat two each day. If in the habit of eating two, lessen the quantity of food you have been eating. After you have reduced your abdominal measurements by thus reducing the quantity of food eaten, for from one to three inches you can then begin the exercises which will be found illustrated in the chapters that follow.

The moment these exercises are begun you should start preparing yourself for a long fast. You should begin this by fasting one day in three. After having passed through five separate fast days, then fast two days out of six, until you have passed through three fast periods. After having completed your last two-day fast, eat four days, then begin a three-day fast. After having completed the three-day fast eat for seven days, after which you are ready to begin the long fast.

The object of this fasting is two-fold: First, to greatly lessen the contents of the abdominal viscera, and second, to gradually purify the blood and thus make it more capable of building strong tissues. You must, of course, expect that the weight will decrease considerably in this process, if you are at all inclined towards stoutness, but that should not cause you the slightest worry, as after your trouble has been remedied this weight can easily be regained. All surplus weight, when curing a disease of this nature, should in every case be discarded, and of course the fasting and dieting we advise will, in nearly every case, accomplish this object. Let me here emphasize the special necessity for carrying out in detail the instructions in reference to fasting. This is really one of the most important parts of the instructions given here. Unless your work is manual and very hard there

should be no necessity of losing any time from your regular occupation while taking this treatment. Of course, during the long fast you may feel rather weak, but if your work is light it will be far easier for you to continue at your occupation, as your mind will be occupied and the fasting period will seem far shorter under these circumstances.

Immediately upon starting the one-day fasts you should begin the first system of exercises found in a chapter to follow, and adhere closely to the suggestions made in reference to them.

The first week they should be taken once daily; the second week, twice daily, and third week, three times daily; on the fourth week the second system should be used, if you have gained sufficient strength, and on each occasion you can gradually increase the time occupied by them. After finishing the two-day fast,

or even before, if you feel sufficiently strong, you can take the exercises four times each day.

Deep breathing, long walks, and, in fact, every means that will tend to build up the general physical health, will of course be of vast assistance.

In eating, thorough mastication is especially essential, and by thorough mastication I mean that every mouthful of food must be actually chewed to a liquid before it is swallowed, and that my reader may not misunderstand me, under such circumstances a mouthful of whole-wheat bread, for instance, will take about one hundred and twenty-five movements of the jaws in order to thoroughly masticate and prepare it for swallowing. I would advise every one taking this treatment to read my book "Strength from Eating," as special points of value will be found along the lines of appetite, mastication

and the value of different kinds of foods.

The diet should be confined mostly to vegetables and grains, but little meat should be eaten, and, as stated before, the extreme necessity for curtailing the quantity at each meal cannot be too strongly emphasized.

At all times great care should be taken to secure as nearly as possible perfectly pure air. The windows should be wide open in your sleeping room. Discard immediately any fear of taking cold, for after adopting the fasting, dieting and exercise advocated, there is practically no danger of this.

CHAPTER V.

First 15 Days.

SYNOPSIS OF DAY'S WORK.

Immediately upon rising, with windows wide open, take the first system of exercises illustrated in a chapter to follow. Use very great care in the beginning and under no circumstances take those particular exercises which require any great strain. Where they are particularly difficult merely attempt them. Gradually, day by day, you will find your strength increasing, and when sufficiently strong, these more difficult exercises can be performed.

Follow these exercises by a friction bath, securing two soft bristle brushes and rubbing the body all over, back and forth until the skin is pink from accelerated circulation brought to the surface.

Follow this by a cold sitz bath of from one to five minutes, immersing the hips only in the water.

After this dash water all over the body and dry thoroughly with rough towels.

Take exercises the same on fast days as you do on other days. Eat breakfast only on the days after fast days. On such occasions a little fruit may be eaten. Eat the first meal between ten and one o'clock, whenever convenient, and do not forget to thoroughly masticate your food.

Sometime during the middle of the forenoon, or the afternoon, if possible, take a long walk, with many deep breathing exercises.

After the first three or four days, if the soreness of the abdominal region caused by using those muscles, begins to disappear, exercises may be taken twice daily. They may be taken the second

time in the middle of the afternoon, or just before retiring, whichever desired.

Toward the latter part of the fifteen days if the abdominal muscles seem to have secured sufficient strength, the exercises may be taken three times daily.

Next 18 Days Treatment.

SYNOPSIS OF THE DAY'S WORK.

The same routine can be followed during the next eighteen days of the treatment, during which time you are fasting two days out of six, and during which time you must increase the time you devote to the special, and other, exercises. After the first week of this eighteen days of treatment, the second system of exercise should be substituted for the first system. If you would increase the length of your walks and give more accurate attention to every possible means of building up the muscular and

general vigor of your entire body it would be of very great aid.

Next 10 Days.

SYNOPSIS OF THE DAY'S WORK.

During the next ten days of the treatment, the first three being devoted to a fast, the same daily routine can be followed. You can break the three days' fast on a little fruit which may be enjoyable, though special care must be taken to avoid overeating after this fast. At no meal should you eat more than about half the quantity you feel you really desire.

CHAPTER VI.

LONG FAST.

After having passed though the instructions previously given, you are now prepared for one of the most difficult parts of the treatment, namely, the long fast. It has taken some little determination to go through what has already been advised, and just a little more determination now should carry you through the most difficult part, and then the cure should not be far off.

In a previous part of the book I have called your attention to the necessity for having those around you in full sympathy with this theory of the cure. If your friends and relatives are continually endeavoring to lessen your faith and break down your determination to continue, it

vastly increases the difficulty of properly carrying out the process of cure. A fast of any kind is not a particularly easy method of treatment. It revolutionizes one's habits so thoroughly that all possible determination is needed, and when the influences of all those with whom you come in contact are against a continuation of this fasting process, your will power will have to be of great strength in order to carry out the fast successfully.

The object of this fast is to thoroughly cleanse the system of all foreign, impure matter, and thoroughly empty the bowels, thus taking away their tendency to press upon the ruptured part.

Please remember that by fasting I mean absolute fast. No liquid food of any kind is allowed under these circumstances. You may drink water freely whenever the same is desired. It is not at all an infrequent occurrence for one

to become dizzy, and feel so weak that walking even is difficult. In a fast of this duration this feeling is abnormal. In nearly every case, a few steps, deep-breathing exercises, or any means that will tend to accelerate the circulation will quickly remedy this unpleasant symptom.

The tongue will frequently be thickly coated, showing that the process of recovery is being hastened to the greatest possible degree. The breath is sometimes foul during a fast of this character, denoting that the impurities are being eliminated through the lungs.

Occasionally there is great difficulty experienced in sleeping. This should cause no worry, for when no strength is required for the digestion far less rest is needed. The work required of the nervous system is greatly lessened, and

to a corresponding degree less recuperation is required in sleep.

During this long fast you can take the regular exercises advised previously, up to the third or fourth day, or during the entire fast, if you feel sufficiently strong. If at any time they become too difficult or seem to require too much of an effort you may omit the more difficult exercises until you begin to take regular nourishment.

A great many fear that there may be danger of death from want of nourishment during the fast. This is practically of no importance. I have never heard of but one individual dying during a fast, and strange to relate those who have made a reputation for long fasts live to remarkably old age.

Dr. Tanner, who we remember as fasting forty days, twenty to twenty-five years ago, is still alive, hale and hearty. The

celebrated Frenchman who has a record of fasting sixty days, thinks nothing of fasting forty days merely for pleasure. Fasts of ten days or two weeks at my experimental Health Home were considered of no particular importance. Over half the patients who came to us would voluntarily fast a week. Therefore the fast of seven to fourteen days that I am asking you to take in this instance is of no great importance so far as the danger of death is concerned.

Where a fast has continued so long that there is danger of death the heart action will usually fall to twenty or thirty per minute and will be very faint. It has not been definitely proven that there is danger even at this point, but under circumstances of this nature I would of course not advise that the fast be continued. As a rule in a fast of from seven to fourteen days the pulse will not fall

below forty, and frequently not below fifty or sixty. I had one patient at the experimental Health Home whose pulse fell to twenty and was so faint that it could hardly be felt after a fast of three weeks. It quickly rose after the patient took some nourishment.

CHAPTER VII.

HOW TO BREAK FASTS.

After you have concluded that your fast has continued a sufficient length of time, remembering distinctly my suggestion that it continue for at least seven days, it is very important that you give especial attention to the necessity for extreme care in eating the proper kind and proportion of food.

I would advise that the first meal consist of two or three oranges, or of some other watery fruit which is relished. This must be masticated very thoroughly, even if it is only orange juice.

Three or four hours afterward you might eat a banana or some fruit of a similar nature, though very great care must be used in selecting fruit of a

proper degree of ripeness, neither too ripe nor too green.

Four or five hours after this a similar meal can be eaten and a very small quantity of nuts of some kind or some green vegetables like tomatoes can be added to it.

The next day you should begin on a two-meal-per-day plan, consisting entirely of fruit, nuts, or any raw vegetable such as lettuce, celery, radishes, that you may relish. At first you may not relish this extremely limited raw diet, though after a time it should be enjoyed almost to a similar degree with cooked food.

At the end of this chapter you will find a list of foods and you can select from this those which you consider most palatable. There is not so much danger of overeating in foods of this character as in cooked foods, though great care is

necessary to avoid this, and you should remember that it is far better to eat too little than to eat too much. As I have stated previously, the weight you may lose is of little consequence, as it can easily be regained and even increased after recovery has been complete, if desired.

The very great importance of the adoption of this diet cannot be too strongly emphasized. Foods of this character rarely distend or gorge the alimentary canal, and as a result there is practically no undue pressure on the parts where the rupture has been produced. Furthermore, foods of this nature are more concentrated, they contain more nourishment per pound than the ordinary cooked foods. Nuts, especially, contain large quantities of oil and are a highly concentrated food. After becoming accustomed to the diet would

advise that at each meal at least an eighth of a pound of these nuts be eaten at the first part of the meal mixed with uncooked whole wheat or whole wheat meal if teeth are not strong. This combination will make a very valuable food.

CHAPTER VIII.

SYSTEMS OF EXERCISE.

First System—To be used first three weeks of treatment.

For the sake of variety and to give each pupil a graduated method of exercise, that there may be less danger of strain, I have illustrated three different systems of exercises.

At the very beginning of this chapter, referring to exercises, I wish particularly to emphasize the necessity for the greatest possible care to avoid strain. This is more especially essential at the beginning. At first only the easier exercises should be performed, and the more difficult movements might merely be attempted, but the attempt must not be too vigorous. If the importance of this particular warning is

not fully understood and heeded, there are liable to be results produced that will make the trouble that you are attempting to cure far worse in character. In many cases the muscles will be sore for a few days, not being accustomed to use. Not infrequently they become painfully sore. If this soreness is especially bad would advise that the exercises be omitted for one or two days, though usually by rubbing the affected muscles thoroughly and by using them slightly the soreness will disappear much quicker than if allowed to remain entirely inactive. There is less liability of this soreness if one will rub the muscles thoroughly immediately after taking the exercises the first few times.

The regular truss that you are in the habit of wearing should be used when taking these exercises until after your increased strength has demonstrated beyond all possible doubt that you are safe in at-

tempting the exercises without wearing a device of this character.

In order to be able to conveniently refer to the different exercises I have designated these three systems as first, second and third.

The first system which will be illustrated should be taken on a reclining padded board or sofa, which has been so arranged that the feet will be raised at least two feet higher than the head. The most convenient way to take these exercises is to take an ordinary divan, or sofa, and place the legs of one end on a box or anything which will raise it to the desired height, viz., two feet. Have someone to assist you to see that the sofa maintains its position without falling and there will be no need of a strap or rope for keeping the feet in proper position, as the assistant can merely place his hands on your feet while you are taking the various ex-

ercises. If you have not the aid of an assistant of this character you will have to secure an ordinary trunk strap which will reach around the sofa or divan or whatever you may use. This should be firmly fastened in order that the feet may be maintained in a proper position when the ankles are placed under the strap.

It will not be particularly easy to assume the position illustrated at first, and the greatest possible care is advised in your first few endeavors. In fact, it is of importance at the beginning, especially if you are not particularly strong, to have an assistant to help you in assuming the positions illustrated.

The particular object of these various systems of exercise is to so strengthen, toughen and develop the cords and muscles in the affected part of the body as to gradually close the opening

which is the primary cause of the rupture.

First, the pupil must understand that this is a very slow process, and it will take some time to produce any marked improvement. Of course, in two or three weeks an increase in strength in the parts should be noticed, and after that the advance toward a cure will be more speedy, as you will then develop sufficient strength to be able to take a large amount of the exercises here illustrated.

In the beginning, if you are able to perform the movements without any great effort, it would be advisable for you to continue the movements until a slight feeling of fatigue is induced. If you have taken the exercises for some time, and have been able to develop considerable endurance, each exercise should be continued until the muscles used are thoroughly fatigued.

The first system of exercise will be found comparatively easy with the exception of the last two movements, though especial care must be taken in the beginning to acquire the positions illustrated without any possibility of strain, and the suggestion already made that an assistant should be used in your first attempts should be remembered.

EXERCISE A.

FIRST SYSTEM, EXERCISE A.

In the exercise here illustrated you simply recline on your back as shown in the illustration, with your hands placed at the waist line. Keep the legs rigid and attempt to raise the head and shoulders, until free from contact with the couch.

Variation—Hold the arm straight outward to the sides, or allow them to hang downward and repeat same exercise.

Variation—Hold them straight upward and repeat same exercise.

Variation—Place hands on the legs as far down as you can and repeat the same exercise.

EXERCISE B.

FIRST SYSTEM, EXERCISE B.

Swing the arms far over to the right, twist the body far over from the waist line as much as possible.

Variation—Swing the body far over to the left as above.

This exercise is comparatively simple. The head, shoulders and chest need not be raised during the movement, and the muscles around the waist line only being used for this twisting movement.

EXERCISE C.

FIRST SYSTEM, EXERCISE C.

Raise the shoulders and head free from contact with the couch and throw arms to the left, twisting body from the waist line as shown in the illustration.

Variation—Same exercise to the right.

This exercise may be found rather difficult and must be performed very carefully at the beginning. If too much effort is required the movement can be taken with the head only raised. This exercise differs from the preceding only in the raising of the head and shoulders free from the couch while twisting the body.

EXERCISE D.

FIRST SYSTEM, EXERCISE D.

Recline with body rigid and the arms stretched far back behind. Then raise the shoulders from contact with the couch as shown, keeping the arms stretched far behind.

Variation—Clasp the hands over the head and repeat as above.

Variation—Clasp hands over head and twist body from the waist first to the right and then to the left.

This is an exceedingly difficult exercise and must be taken with the greatest possible care in the beginning.

EXERCISE E.

FIRST SYSTEM, EXERCISE E.

Recline with the body rigid, hands at the waist. Now slowly raise until the body assumes a sitting position as shown in the illustration.

Variation—Raise body to a sitting position, then go backward to the right and same to the left.

Variation—Place hands far down on the legs and raise as above.

This is an exceedingly difficult exercise and but few dare attempt its complete performance at the beginning, although after considerable practice it can be performed without any special effort.

CHAPTER IX.

SECOND SYSTEM OF EXERCISES.

To be begun fourth week of treatment and to be used until two weeks after the long fast.

Most of the exercises here illustrated will be found much more difficult than those in the preceding system, but after having followed the exercises previously illustrated for three weeks they should be performed without any great amount of effort.

It is well to remember that no matter how strong one may be, exercise taken in a position so radically different from all those previously performed usually produces fatigue and between each exercise it would be well to rest for a few moments.

When you are able to take the exercises of this system without strain you can stop the system previously illustrated

and devote all attention to movements shown here.

I desire to again emphasize the necessity for great care and for avoiding any possibility of strain in the various exercises. The system here illustrated requires very vigorous action on the part of the muscles affected and it will probably be impossible for a beginner if he is not fairly strong to go through the entire system the first time attempted.

There are several means of assuming the positions illustrated, but about the easiest method will be to take an ordinarily strong chair with a flat back and cover with cushions and pillows sufficiently to make one comfortable while assuming the various positions illustrated.

Of course if a chair is used a board or something of this nature will have to be strongly fastened across the lower legs in order to furnish the proper support for the hips.

EXERCISE A.

SECOND SYSTEM, EXERCISE A.

Recline as shown in illustration, grasping the chair with the hands back of the head. Raise right leg to a perpendicular position. same exercise with the left leg.

Variation—Raise right leg and bring it as far forward as possible. Same exercise with left leg.

This exercise should not be found particularly difficult.

EXERCISE B.

SECOND SYSTEM, EXERCISE B.

Recline, grasping chair behind head with legs stretched out and knees straight. Now bend the legs at the knee and bring the legs up as shown in the illustration.

Variation—Bend the legs at the knee and bring the legs up as near the chest as possible.

This exercise should not be found particularly difficult, though it will usually tire one after a few efforts.

EXERCISE C.

SECOND SYSTEM, EXERCISE C.

Reclining with the hands clasped behind the head. Beginning with the right leg held upward in a perpendicular position, swing the leg over to the left as shown in the illustration. Same exercise with the left leg.

Variation — Same exercise as shown above, twisting the foot as far around as possible in both directions during the movement.

This exercise should not be found particularly difficult.

EXERCISE D.

SECOND SYSTEM, EXERCISE D.

Recline with the hands grasping the chair behind head; you will no doubt be compelled to grasp the chair a little stronger in this exercise to properly balance body.

With the right leg stretched straight upward in a perpendicular position bring it over to the right as far as possible. Same exercise with the left leg.

Variation — Same exercise as above, twisting the foot during the movement as far as possible in one direction and then in the other direction.

EXERCISE E.

SECOND SYSTEM, EXERCISE E.

Cross the legs as shown in illustration, grasping the chair very tightly behind head, turn the body at the waist until the weight very nearly rests on the right hip. The same exercise turning the body until the weight very nearly rests on the left hip.

This exercise is sometimes difficult, though a few attempts will enable one to perform it with comparative ease.

EXERCISE F.

SECOND SYSTEM, EXERCISE F.

Grasp the chair very tightly in this exercise as it will be found difficult to balance the body. With both legs stretched upward in a perpendicular position allow them to sway over to the right as shown in the illustration. Same to the left.

This exercise is quite difficult and the pupil may not be able to properly perform it during the first few attempts.

EXERCISE G.

SECOND SYSTEM, EXERCISE G.

Grasp the chair firmly. With legs in position as shown in illustration allow the legs to go slowly downward until the feet nearly touch the floor.

Variation—Allow the legs to go backward to the right, same to the left. This should be performed very carefully during the first attempts.

EXERCISE H.

SECOND SYSTEM, EXERCISE H.

With the body in position shown, turn it at the waist line until the weight of the hips rests very nearly on the right hip, and raise the legs until they are in a perpendicular position. The same exercise turning the body to the left hip and raising legs to a perpendicular position.

This exercise will be found difficult and great care must be used in the first few attempts.

EXERCISE I.

SECOND SYSTEM, EXERCISE I.

From position illustrated in previous exercise raise the legs and bring them far backward as shown in this illustration.

Variation—Raise the legs from position illustrated in previous exercise and bring them far backward to the right in a similar position as shown in this illustration. Same exercise to the left.

This is an exceedingly difficult exercise, and usually even a strong person cannot properly repeat each variation more than three or four times.

CHAPTER X.

THIRD SYSTEM OF EXERCISES.

To be begun two weeks after long fast has been broken.

Some of the exercises illustrated in this system will be found a trifle more difficult than those illustrated in the previous system, and the writer must again emphasize the necessity for extreme care to avoid the possibility of strain.

It will be noted in the illustrations of this particular system that the body is resting on a padded board and the feet are about twelve inches higher than the hips.

About the best method of arranging to take the exercises of this system is to secure a strong board and fasten it very securely in some manner before attempting the various movements required.

The lower portion of the board on which the hips rest should be of sufficient height so that when the body is stretched out, the head will barely touch the floor, and, as stated before, the feet should be about twelve inches higher than the hips.

As you will note in the various illustrations, two strong trunk straps must be used. One to be placed around the ankles to hold them in position, and another to be tightly strapped around the legs, just below the hips. Assistance will be required for one to take this system in the beginning.

EXERCISE A.

THIRD SYSTEM, EXERCISE A.

With the hands on the waist line as shown, raise the head, the chest and the shoulders until the body is on a line with the legs.

Variation—With hands on the waist, raise the body until in line with legs, to the right and same to left.

EXERCISE B.

THIRD SYSTEM, EXERCISE B.

With the body as shown in the previous illustration, turn far to the right, swinging arms as shown in this illustration. Same exercise to the left.

Variation—Place the hands on waist line and turn far to the right and then far to the left. This exercise should not be found very difficult.

EXERCISE C.

THIRD SYSTEM, EXERCISE C.

With hands resting at the waist line as shown in exercise A of this system, raise body to the right as shown in this illustration. Same exercise to the left.

Variation—Raise body toward the right and then twist it at the waist line as far to the right as possible. Same to the left.

This exercise will be difficult and should be performed only a few times at the beginning.

EXERCISE D.

THIRD SYSTEM, EXERCISE D.

Raise body to position shown in illustration, then keep the body perfectly rigid, look straight upward, swaying from the waist line as far to the right as possible, then as far to the left as possible.

This is a very difficult exercise, and should be taken with the greatest possible care during the first few attempts.

EXERCISE E.

THIRD SYSTEM, EXERCISE E.

With body in position as shown in illustration, sway the body from the waist far over to the right, then raise shoulders, chest and head until on a line with the legs. Same exercise to the left. Great care must be used in the first few attempts.

EXERCISE F.

THIRD SYSTEM, EXERCISE F.

From the position, with head hanging far down, raise to a sitting position, as shown in illustration.

Variation—Raise to a sitting position, grasp at the ankles as you rise, and bend as far forward as possible.

This exercise will be found exceedingly difficult, and one must develop considerable strength before it can be performed. The greatest possible care must be used in the first few attempts.

EXERCISE G.

THIRD SYSTEM, EXERCISE G.

Raise from a sitting position as shown in the previous illustration, bend at the waist line far to the left and then far to right.

Variation—Bend from a sitting position, far to the right at the waist line, same to the left, and then backward as far as possible.

This is an especially difficult exercise, and must never be attempted until one has secured a very great amount of strength, and until the process of cure has neared completion.

CHAPTER XI.

DIETETIC INSTRUCTIONS.

During the first fifteen days of treatment I would advise that no very great change be made in your diet further than following the suggestions given heretofore. Follow the two-meal-per-day plan, and keep the quantity of food that you eat to the lowest possible amount. Of course all foods that do not agree with you, or which have a tendency to tax the digestive organs, and do not supply nourishment in proportion to the efforts expended in digesting, should be avoided. Be sure to eat very lightly of meat. Eat peas, beans, lentils, or foods of this nature to replace the elements of nourishment furnished by meat. Avoid white bread, or any article of food that is made from

white flour. Coffee, tea and alcoholic stimulants of every character must be avoided absolutely. If you are not willing to give up stimulants of every nature, there is not the slightest use of trying to effect a cure.

If one is inclined to be very fat, he must be especially abstemious at the table. This extra amount of fatty tissue must be absorbed before there can be much chance of effecting a cure of this trouble.

The importance of thorough mastication, that is, masticating every morsel of food until it becomes a liquid, has been mentioned before, but it can hardly be emphasized too strongly. Do not drink liquids of any kind at meals, unless to actually satisfy thirst. Never drink anything while food is in the mouth.

After a cure of your trouble has been effected, would advise you to immediately

begin to drink very freely of good, pure water. If you cannot get it pure, secure distilled water. About the purest distilled water is that which falls as rain, though it should be caught on perfectly clean roofs, and stored in perfectly clean vaults. If you cannot secure this you should distill it yourself, or buy distilled water.

Before the cure has been effected you should always drink sufficient to satisfy ordinary thirst, though if you drink too much it is inclined to distend the stomach. But when cured encourage the desire for water at all times, as it is valuable in cleansing the body of impurities.

Two or three weeks prior to the beginning of the long fasts, would advise that the various uncooked foods found in the list to follow be used with the ordinary cooked foods, in order that you may develop, if possible, an appetite for the same. Do not feel discouraged if you do not

seem to relish these foods. The hunger induced by the long fast advised will make a vast change in the condition of your appetite.

Now, keeping in mind the instructions already given for breaking the long fast, the uncooked foods, mentioned further along, must be used entirely, following this fast. I have explained fully the particular reason for using foods of this nature, and to one who has not given the matter any thought it might seem extremely difficult to subsist on such foods. Numerous persons, however, are at the present time subsisting in a very healthy and vigorous condition on foods of this nature. The writer followed an uncooked diet for over two months on one occasion, and he intends ultimately to adopt it as a steady diet, as he firmly believes that it will add many years to his life, and make it far more easy to maintain vigorous health.

It certainly taxes your digestive organs to a far less degree, and that uncomfortable feeling which is frequently noted after a hearty meal of cooked foods, is never experienced when eating foods of this nature. They unquestionably contain more nourishment per pound and are in a better condition to be assimilated, than foods put through a prolonged cooking process.

Would advise that you select your meals from the list of foods herein given according to the dictates of your appetite. You can use salt on these foods just as you do on cooked foods. Please remember that they must be eaten raw. A very appetizing dish can be made of a mixture of any of the green vegetables by pouring a salad dressing over them, made from half lemon juice and half olive oil, well seasoned with salt and well mixed and beaten with a fork before using.

LIST FOR SELECTION OF UNCOOKED FOODS TO BE USED AFTER LONG FAST.

Apples
Apricots
Almonds
Butter milk
Bananas
Blackberries
Beechnuts
Brazil nuts
Butternuts
Cheese, fresh
Cabbage
Celery
Cherries
Currants
Cranberries
Chestnuts
Cocoanuts
Eggs, beaten with milk if desired
Figs
Filberts
Grapes
Huckleberries
Lettuce
Lemons
Muskmelons
Nectarines
Oranges
Potatoes
Peanuts
Pine nuts
Pears
Persimmons
Pineapples

Plums
Pomegranates
Prunes
Radishes
Raisins
Raspberries
Sweet milk
Strawberries
Tomatoes
Turnips
Onions
Watermelons
Whortleberries
Walnuts, California
Walnuts, black

CHAPTER XII.

TRUSSES.

Throughout this entire treatment the ordinary truss must be worn just as before the treatment until the long fast has been reached. After this fast has been continued a few days you may be able to change this truss for one which exerts less pressure, and on which the pressure is exerted by a flat instead of a round surface.

Very great care must be used in changing this truss. If you have an expert whom you can consult as to the change, it is well to do so. You should secure another truss which has the point of the pressure flat instead of round, and give this a trial. If it does not seem to keep the rupture closed, of course you will

have to go back to the old truss and continue same until you are able to use the other. As soon as possible, of course, it is advisable for you to begin using the new truss, but the necessity for great care in changing cannot be too strongly emphasized.

After you have finished the long fast and have continued the new concentrated fruit, nut and raw vegetable diet for three to four weeks, and have been able for some time to use the new truss, slight experiments may be made with the object of going without the truss entirely. For instance, if you are able to stand and walk around without any noticeable signs of pain or otherwise of the rupture coming down, the truss can be laid off for a short time each day. Each week the time that you go without the truss can be lengthened, and in six or eight weeks you should be able to begin to omit, even for

a short time the use of the truss. Gradually increase the number of exercises taken. During the fast and following it these exercises should be taken from four to five times each day, and when you begin to omit the use of the truss they should be increased still more. Be sure to keep constantly in mind the necessity for continuing each one of these exercises to the point of fatigue.

CHAPTER XIII.

THE CURE EFFECTED.

After you have been able to entirely discard the use of the truss, do not for a moment consider yourself absolutely well. There is, of course, still some weakness in that particular region. The exercises which you have taken, and the general treatment which you have undergone, have, of course, vastly strengthened these parts, but you will remember that this strength will rapidly disappear unless the exercises which have enabled you to acquire it are continued for some time after the cure is supposed to have been effected. There is, of course, no necessity for continuing them to the same extent required to bring about the cure, but they

should be taken at least twice daily for some months, and, in fact, if they were continued at least once a day all during life, there would never be the slightest possibility of a recurrence of the trouble.

In reference to diet after you have been able to discard the use of a truss, or even when you have begun to go without a truss for a time, you might begin the use of some cooked foods, if you so desire, but until the cure has been effected it will be far better for you to confine your diet entirely to those foods which must follow the long fast, a list of which will be found in the chapter on diet. Then there will be no risk, and the cure is almost certain, while if the use of cooked foods is begun you are, of course, encouraged to eat greater quantities than is necessary to nourish the system, and furthermore, it takes greater quantities to furnish proper nourishment.

CHAPTER XIV.

We present in succeeding pages an extract from Gray's Anatomy, descriptive of the anatomy of the region of Inguinal Hernia, for the perusal of those who may desire to familiarize themselves with the technical anatomical aspects of this trouble. This article gives the anatomist's analysis of the bones, nerves, arteries, veins, muscles, ligaments, etc., of the region most affected by hernia, and will be found of advantage by those who attempt scientific methods of strengthening the muscles and ligaments that act as retainers at this point. We have included in this extract the original illustrations, from which the reader may accurately trace the direction taken by the rupture, and understand the changes necessary in

the surrounding envelope, to effect a cure. It is not necessary that you should study this description in order to apply the principles set forth in preceding pages, but if you wish to become familiar with the character and technical nomenclature of the disease you should read this extract carefully.

The Surgical Anatomy of Inguinal Hernia.

Dissection (Fig. 446). For the dissection of the parts concerned in inguinal hernia, a male subject, free from fat, should always be selected. The body should be placed in the supine position, the abdomen and pelvis raised by means of blocks placed beneath them, and the lower extremities rotated outwards, so as to make the parts as tense as possible. If the abdominal walls are flaccid, the cavity of the abdomen should be inflated by an aperture through the umbilicus. An incision should be made along the middle line, from the umbilicus to the pubes, and continued along the front of the scrotum; and a second incision, from the anterior superior spine of the ilium to just below the umbilicus. These incisions should divide the integument; and the triangular-shaped flap included between them should be reflected downwards and outwards, when the superficial fascia will be exposed.

Inguinal Hernia is that form of protrusion which makes its way through the abdomen in the inguinal region.

The *superficial fascia* in this region consists of two layers, between which are found the superficial vessels and nerves, and the inguinal lymphatic glands.

The superficial layer is thick, areolar in texture, containing adipose tissue in its meshes, the quantity of which varies in different subjects. Below, it passes over Poupart's ligament, and is continuous with the outer layer of the superficial fascia of the thigh. This fascia is continued as a tubular prolongation around the outer surface of the cord and testis. In this situation, it changes its character; it becomes thin, destitute of adipose tissue, and of a pale reddish color, and assists in forming the dartos. From the scrotum, it may be traced backwards to be continuous with the superficial fascia of the perineum. This layer should be removed, by dividing it across in the same direction as the external incisions, and reflecting it downwards and outwards, when the following vessels and nerves will be exposed:—

The superficial epigastric, superficial circumflex iliac, and external pudic vessels; the terminal filaments of the ilio-hypogastric and ilio-inguinal nerves; and the upper chain of inguinal lymphatic gland.

The *superficial epigastric artery* crosses Poupart's ligament, and ascends obliquely towards the umbilicus, lying midway between the spine of the ilium and the pubes. It supplies the integument, and anastomoses with the deep epigastric. This vessel is a branch of the common femoral artery, and pierces the fascia lata, below Poupart's ligament. Its accompanying vein empties itself into the internal saphenous, after having pierced the cribriform fascia.

The *superficial circumflex iliac artery* passes outwards towards the crest of the ilium.

The *superficial external pudic artery* passes transversely inwards across the spermatic cord, and supplies the integument of the hypogastric region, and of the penis and scrotum. This vessel is usually divided in the first incision made in the operation for inguinal hernia, and occasionally requires the application of a ligature.

The veins accompanying these superficial vessels are usually much larger than the arteries; they terminate in the internal saphenous vein.

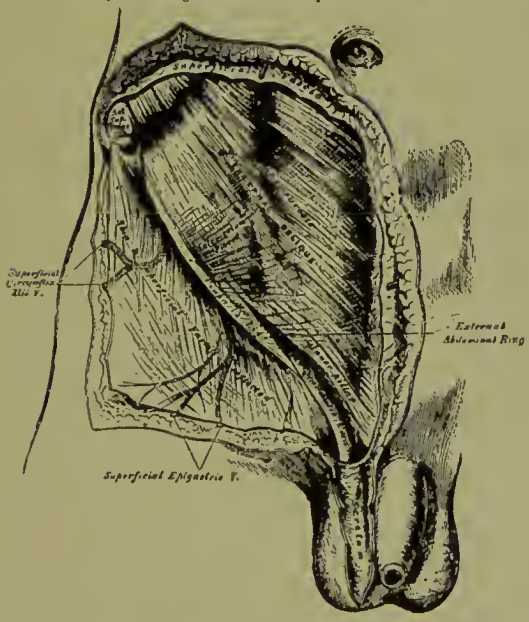
Lymphatic vessels are found, taking the same course as the bloodvessels; they return the lymph from the superficial structures in the lower part of the abdomen, the scrotum, penis, and external surface of the buttock, and terminate in a small chain of lymphatic glands, three or four in number, which lie on a level with Poupart's ligament.

Nerves. The terminal branch of the ilio-inguinal nerve emerges at the external abdominal ring; and the hypogastric branch of the ilio-hypogastric nerve

perforates the aponeurosis of the external oblique, above and to the outer side of the external ring.

The *deep layer of superficial fascia* should be divided across in the same direction as the external incisions, separated from the aponeurosis of the External Oblique, to which it is connected by delicate areolar tissue, and reflected downwards and outwards. It is thin, aponeurotic in structure, and of considerable strength. It is intimately adhereat, in the middle line, to the linea alba, and below, to the whole length of Poupart's ligament and the upper part of the fascia lata. It forms a thin tubular prolongation round the outer surface of the cord, which blends with the superficial layer, and is contiauous with the dartos of the scrotum. From the back of the scrotum, the conjoined layers may be traced into the perineum, where they are continuous with the deep layer of the superficial fascia in that regioa, which is attached, behiad, to the triangular ligament, and on each side, to the ramus of the pubes and ischium. The connections of this fascia serve to explain the course taken by the urine in extravasation of that fluid from rupture of the urethra; passing forwards from the perineum into the scrotum, it ascends on to the abdomen, but is prevented extending into the thighs by the attachment of the fascia to the ramus of the pubes and ischium, on each side, and to Poupart's ligament in front, and is prevented from passing on to the buttock by the posterior connections of the perineal fascia.

Fig. 446.—Inguinal Hernia. Superficial Dissection.



The *aponeurosis of the External Oblique muscle* is exposed on the removal of this fascia. It is a thin, strong, membranous aponeurosis, the fibres of which

nre directed obliquely downwards nnd iawards. It is attacbed to the anterior superior spinous process of the ilium, the spine of the pubes, the pectineal line, front of the pubes, and liaea alba. That portion of the aponeurosis which extends from the anterior superior spine of the ilium, to the spine of the pubes is termed Poupart's ligament, or the crural nreh; and that portion wbicb is inserted into the pectineal lino, is termed Gimbernat's ligament.

Just nbove nnd to the onter edge of the crest of the pubes, a triangular interval is seen in the aponeurosis of tbe Exteraal Obliquc, called the *external abdominal ring*, which transmits the spermatic cord in the malc, and the round ligament in the female. This aperture is oblique in direction, somewhat triangulnr in form, and corresponds with the course of the fibres of the aponeurosis. It usually measures from base to apex nbout an inch, and transversely about hnlf nn inch. It is bounded below by the crest of tho os pubis; above, by n series of curved fibres, the *intercolumnar*, wbicb pass across the upper angle of the ring so as to increase its strength; and on either side, by the free borders of the aponeurosis, which nre called the *columns* or *pillars of the ring*.

The *external pillar*, which, at the snme time, is inferior from tbe obliquity of its direction, is the stronger; it is formed by tbnt portion of Poupart's ligàment which is inserted into tbe spine of the pubes; it is curved round the spermatic cord, so ns to form n kind of groove, upon which the cord rests.

Tbe *internal* or *superior pillar* is a broad, thin, flat band, whicb interlaces with its fellow of tbe opposite side, in front of the sympbysis pubis, tbat of the right side being superficial.

Tbe external abdominal ring gives passage to the spermatic cord in tbe male, nnd round ligament in the female; it is much larger in men than women, on account of the large size of tbe spermatic cord, and hence the greater frequency of iaguinal hernia in men.

The *intercolumnar fibres* arc a series of curved tendinous fibres, wbicb arch across tbe lower part of tbc aponeurosis of the External Obliquc. Thcy have received their name from stretching across between the two pillars of the external ring; they increase the strengtb of the membrano which bounds the upper part of this nperture, and prevent the divergence of tbe pillnrs from one nnother. They nre thiekest below, wbere they are connected to the outer third of Poupart's ligament, and are inserted into the linea alba; describing a curve, with tbe convexity downwards. Thcy nre much thicker and stronger at the outer angle of the externnl ring than internally, and are morc strongly developed in the male than in the female. These fibres are continuous with a thin fascia, wbich is closely connected to the margins of the external ring, and bns received tbc name of the *intercolumnar* or *external spermatic fascia;* it forms a tubular prolongation around the outer surface of tbe cord and testis, nnd incloses them in n distinct sheath. Tbc sac of an inguinal hernia, in passing througb the external abdomiaal ring, receives an iuvestment from the intercolumnar fascia.

The finger should be introduced n sbort distance into the external ring, and then, if the limb is extended and rotated outwards, the aponcurosis of the External Oblique, together with the iliac portion of the fascia lata, will be felt to become tense, and the external ring much contracted; if the limb is, on tbe contrary, flexed upon the pelvis and rotated inwards, this aponcurosis will become lax, nnd the external ring sufficiently enlarged to admit the finger with comparative ease; hence the patient should always bc put in the latter position when the taxis is nppliecl for the reduction of an inguinal hernia, in order that the abdominal walls may be as much relnxed as possible.

The aponeurosis of the External Oblique should be removed by dividing it across in the same direction as the external incisions, and reflecting it outwards; great care is requisite in separating it from the aponeurosis of the muscle beneath. The lower part of the Internal Oblique and Cremaster are then exposed, together with the inguinal canal, which contains the spermatic cord (Fig. 447). The mode of insertion of Poupart's and Gimbernat's ligaments into the pubes should also be examined.

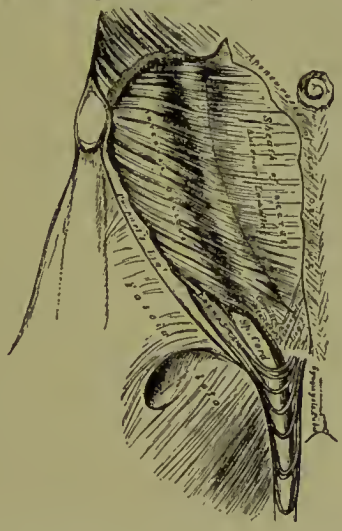
Poupart's ligament, or the crural arch, extends from the anterior superior spine of the ilium to the spine of the pubes. It is also attached to the pectineal line to the extent of about an inch, forming Gimbernat's ligament. Its general direction is curved towards the thigh, where it is continuous with the fascia lata. Its outer half is rounded, oblique in its direction, and continuous with the iliac fascia. Its inner half gradually widens at its attachment to the pubes, is more horizontal in direction, and lies beneath the spermatic cord.

Gimbernat's ligament is that portion of the aponeurosis of the External Oblique which is inserted into the pectineal line, it is thin, membranous in structure, triangular in shape, the base directed outwards, and passes upwards and backwards beneath the spermatic cord, from the spine of the os pubis to the pectineal line, to the extent of about half an inch.

The *triangular ligament* is a band of tendinous fibres, of a triangular shape, which is continued from Poupart's ligament at its attachment to the pectineal line upwards and inwards, behind the inner pillar of the external ring to the linea alba.

The *Internal Oblique Muscle* has been described (p. 361). The part which is now exposed is partly muscular and partly tendinous in structure. Those fibres which arise from the outer part of Poupart's ligament are thin, pale in color, curve downwards, and terminate in an aponeurosis, which passes in front of the Rectus and Pyramidalis muscles, to be inserted into the crest of the os pubis

Fig. 447.—Inguinal Hernia, showing the Internal Oblique, Cremaster, and Spermatic Canal.



and pectineal line, to the extent of half an inch, in common with that of the Transversalis muscle, forming by their junction the conjoined tendon. This tendon is placed immediately behind Gimbernat's ligament and the external abdominal ring, and serves to strengthen what would otherwise be a very weak point in the abdominal wall. When a direct inguinal hernia passes through the external ring, the conjoined tendon usually forms one of its coverings.

The *Cremaster* is a slender muscular fasciculus, which arises from the middle

of Poupart's ligament at the inner side of the External Oblique, being connected with that muscle, and also occasionally with the Transversalis. It passes along the outer side of the spermatic cord, descends with it through the external ring upon the front and sides of the cord, and forms a series of loops, which differ in thickness and length in different subjects. Those at the upper part of the cord are exceedingly short, but they become in succession longer and longer, the longest reaching down as low as the testicle, where a few are inserted into the tunica vaginalis. These loops are united together by areolar tissue, and form a thin covering over the cord, the *fascia cremasterica*. The fibres ascend along the inner side of the cord, and are inserted by a small pointed tendon, into the crest of the os pubis and front of the sheath of the Rectus muscle.

It will be observed, that the origin and insertion of the Cremaster is precisely similar to that of the lower fibres of the Internal Oblique. This fact affords an easy explanation of the manner in which the testicle and cord are invested by this muscle. At an early period of fœtal life, the testis is placed at the lower and back part of the abdominal cavity, but, during its descent towards the scrotum, which takes place before birth, it passes beneath the arched border of the Internal Oblique. In its passage beneath this muscle some fibres are derived from its lower part, which accompany the testicle and cord into the scrotum.

It occasionally happens that the loops of the Cremaster surround the cord, some lying behind as well as in front. It is probable that, under these circumstances, the testis, in its descent, passed through instead of beneath the fibres of the Internal Oblique.

In the descent of an oblique inguinal hernia, which takes the same course as the spermatic cord, the Cremaster muscle forms one of its coverings. This muscle becomes largely developed in cases of hydrocele and large old scrotal herniæ. No such muscle exists in the female, but an analogous structure is developed in those cases where an oblique inguinal hernia descends beneath the margin of the Internal Oblique.

The Internal Oblique should be detached from Poupart's ligament, separated from the Transversalis to the same extent as in the previous incisions, and reflected inwards on to the sheath of the Rectus (Fig. 451). The circumflex iliac vessels, which lie between these two muscles, form a valuable guide to their separation.

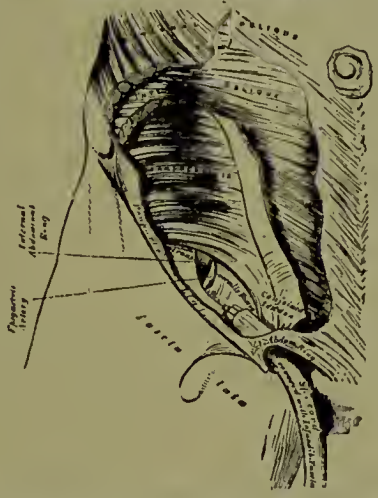
The *Transversalis muscle* has been previously described (p. 362). Its lower part is partly fleshy and partly tendinous in structure; this portion arises from the outer third of Poupart's ligament, and, arching downwards and inwards over the cord, terminates in an aponeurosis, which is inserted into the linea alba, the crest of the pubes, and the pectineal line to the extent of an inch, forming, together with the Internal Oblique, the conjoined tendon. Between the lower border of this muscle and Poupart's ligament, a space is left in which is seen the fascia transversalis.

The *inguinal*, or *spermatic canal*, contains the spermatic cord in the male, and the round ligament in the female. It is an oblique canal, about an inch and a half in length, directed downwards and inwards, and placed parallel with, and a little above, Poupart's ligament. It communicates, above, with the cavity of the abdomen, by means of the internal abdominal ring, which is the point where the cord enters the spermatic canal; and terminates, below, at the external ring. It is bounded, in front, by the integument and superficial fascia, by the aponeurosis of the External Oblique throughout its whole length, and by the Internal Oblique for its outer third; behind, by the conjoined tendon of the Internal Oblique and Transversalis, the triangular ligament, transversalis fascia, and the subperitoneal fat and peritoneum; above, by the arched fibres of the Internal Oblique and Transversalis; below, by the union of the fascia transversalis with Poupart's ligament. That form of protrusion in which the intestine follows the course of the spermatic cord along the spermatic canal, is called *oblique inguinal hernia*.

The *fascia transversalis* is a thin aponeurotic membrane, which lies between the inner surface of the Transversalis muscle and the peritoneum. It forms part of the general layer of fascia which lines the interior of the abdominal and pelvic cavities, and is directly continuous with the iliac and pelvic fasciæ.

In the inguinal region, the transversalis fascia is thick and dense in structure, and joined by fibres from the aponeurosis of the Transversalis; but it becomes thin and cellular as it ascends to the Diaphragm. Below, it has the following attachments: external to the femoral vessels, it is connected to the posterior margin of Poupart's ligament, and is there continuous with the iliac fascia. Internal to the vessels, it is thin, and attached to the pubes and pectineal line, behind the conjoined tendon, with which it is united, and, corresponding to the point where the femoral vessels pass into the thigh, this fascia descends in front of them, forming the anterior wall of the crural sheath.

Fig. 448.—Inguinal Hernia, showing the Transversalis Muscle, the Transversalis Fascia, and the Internal Abdominal Ring.



The *internal abdominal ring* is situated in the transversalis fascia, midway between the anterior superior spine of the ilium and the spine of the pubes, and about half an inch above Poupart's ligament. It is of an oval form, the extremities of the oval directed upwards and downwards, varies in size in different subjects, and is much larger in the male than in the female. It is bounded, above, by the arched fibres of the Transversalis muscle, and internally, by the epigastric vessels. It transmits the spermatic cord in the male, and the round ligament in the female, and from its circumference a thin, funnel-shaped membrane, *the infundibuliform fascia*, is continued round the cord and testis, inclosing them in a distinct pouch. When the sac of an oblique inguinal hernia passes through the internal ring, the infundibuliform process of the transversalis fascia forms one of its coverings.

Between the transversalis fascia and the peritoneum is a quantity of loose areolar tissue. In some subjects it is of considerable thickness, and loaded with adipose tissue. Opposite the internal ring, it is continued round the surface of the cord, forming a loose sheath for it.

The *epigastric artery* bears a very important relation to the internal abdominal ring. This vessel lies between the transversalis fascia and peritoneum, and passes obliquely upwards and inwards, from its origin from the external iliac, to the margin of the sheath of the Rectus muscle. In this course, it lies along the lower and inner margin of the internal ring, and beneath the commencement of the spermatic cord, the vas deferens curving round it as it passes from the ring into the pelvis.

The *peritoneum*, corresponding to the inner surface of the internal ring, presents a well-marked depression, the depth of which varies in different subjects. A thin fibrous band is continued from it along the front of the cord, for a variable distance, and becomes ultimately lost. This is the remains of the pouch of peritoneum which, in the fœtus, accompanies the cord and testis into the scrotum, the obliteration of which commences soon after birth. In some cases, the fibrous band can only be traced a short distance; but occasionally, it may be followed, as a fine cord, as far as the upper end of the tunica vaginalis. Sometimes the tube of peritoneum is only closed at intervals, and presents a saeculated appearance; or a single pouch may extend along the whole length of the cord, which may be closed above; or the pouch may be directly continuous with the peritoneum by an opening at its upper part.

There are two principal varieties of inguinal hernia: external or oblique, and internal or direct.

External or *oblique inguinal hernia*, the more frequent of the two, takes the same course as the spermatic cord. It is called *external*, from the neck of the sac being on the outer or iliac side of the epigastric artery

Internal, or *direct inguinal hernia*, does not follow the same course as the cord, but protrudes through the abdominal wall on the inner or pubic side of the epigastric artery

Oblique Inguinal Hernia.

In Oblique Inguinal Hernia, the intestine escapes from the abdominal cavity at the internal ring, pushing before it a pouch of peritoneum, which forms the hernial sac. As it enters the inguinal canal, it receives an investment from the subserous areolar tissue, and is inclosed in the infundibuliform process of the transversalis fascia. In passing along the inguinal canal, it displaces upwards the arched fibres of the Transversalis and Internal Oblique muscles, and is surrounded by the fibres of the Cremaster. It then passes along the front of the cord, and escapes from the inguinal canal at the external ring, receiving an investment from the intercolumnar fascia. Lastly, it descends into the scrotum, receiving coverings from the superficial fascia and the integument.

The coverings of this form of hernia, after it has passed through the external ring, are, from without inwards, the integument, superficial fascia, intercolumnar fascia, Cremaster muscle, infundibuliform fascia, subserous cellular tissue, and peritoneum.

This form of hernia lies in front of the vessels of the spermatic cord, and seldom extends below the testis, on account of the intimate adhesion of the coverings of the cord to the tunica vaginalis.

The *seat of stricture* in oblique inguinal hernia is either at the external ring, in the inguinal canal, caused by the fibres of the Internal Oblique or Transversalis or at the internal ring, more frequently in the latter situation. If it is situated at the external ring, the division of a few fibres at one point of its circumference, is all that is necessary for the replacement of the hernia. If in the inguinal canal, or at the internal ring, it will be necessary to divide the aponeurosis of the External Oblique so as to lay open the inguinal canal. In dividing the stricture, the direction of the incision should be directly upwards.

When the intestine passes along the spermatic canal, and escapes from the external ring into the scrotum, it is called *complete oblique inguinal*, or *scrotal*

hernia. If the intestine does not escape from the external ring, but is retained in the inguinal canal, it is called *incomplete inguinal hernia* or *bubonocele*. In each of these cases, the coverings which invest it will depend upon the extent to which it descends in the inguinal canal.

There are two other varieties of oblique inguinal hernia: the congenital, and infantile.

Congenital hernia is liable to occur in those cases where the pouch of peritoneum which accompanies the cord and testis in its descent in the fœtus remains unclosed, and communicates directly with the peritoneum. The intestine descends along this pouch into the cavity of the tunica vaginalis, and lies in contact with the testis. This form of hernia has no proper sac, being contained within the tunica vaginalis.

In infantile hernia, the hernial sac descends along the inguinal canal into the scrotum, behind the pouch of peritoneum which accompanies the cord and testis into the same part. The abdominal aperture of this pouch is closed, but the portion contained in the inguinal canal remains unobliterated. The hernial sac is consequently invested, more or less completely, by the posterior layer of the tunica vaginalis, from which it is separated by a little loose areolar tissue; so that in operating upon this variety of hernia, three layers of peritoneum would require division; the first and second being the layers of the tunica vaginalis, the third the anterior layer of the hernial sac.

Direct Inguinal Hernia.

In Direct Inguinal Hernia, the protrusion makes its way through some part of the abdominal wall internal to the epigastric artery, and passes directly through the abdominal parietes and external ring. At the lower part of the abdominal wall is a triangular space (Hesselbach's triangle), bounded, externally, by the epigastric artery; internally, by the margin of the Rectus muscle; below, by Poupart's ligament. The conjoined tendon is stretched across the inner two-thirds of this space, the remaining portion of the space being filled in by the transversalis fascia.

In some cases the hernial protrusion escapes from the abdomen on the outer side of the conjoined tendon, pushing before it the peritoneum, the subserous cellular tissue, and the transversalis fascia. It then enters the inguinal canal, passing along nearly its whole length, and finally emerges from the external ring, receiving an investment from the intercolumnar fascia. The coverings of this form of hernia are precisely similar to those investing the oblique form.

In other cases, and this is the more frequent variety, the intestine is either forced through the fibres of the conjoined tendon, or the tendon is gradually distended in front of it, so as to form a complete investment for it. The intestine then enters the lower end of the inguinal canal, escapes at the external ring lying on the inner side of the cord, and receives additional coverings from the superficial fascia and the integument. This form of hernia has the same coverings as the oblique variety, excepting that the conjoined tendon is substituted for the Cremaster, and the infundibuliform fascia is replaced by a part of the general fascia transversalis.

The *seat of stricture* in both varieties of direct hernia is most frequently at the neck of the sac, or at the external ring. In that form of hernia which perforates the conjoined tendon, it not unfrequently occurs at the edges of the fissure through which the gut passes. In dividing the stricture, the incision should in all cases be directed upwards.

If the hernial protrusion passes into the inguinal canal, but does not escape from the external abdominal ring, it forms what is called *incomplete direct hernia*. This form of hernia is usually of small size, and in corpulent persons very difficult of detection.

Direct inguinal hernia is of much less frequent occurrence than the oblique

their comparative frequency being, according to Cloquet, as one to five. It occurs far more frequently in men than women, on account of the larger size of the external ring in the former sex. It differs from the oblique in its smaller size and globular form, dependent most probably on the resistance offered to its progress by the transversalis fascia and conjoined tendon. It differs also in its position, being placed over the pubes, and not in the course of the inguinal canal. The epigastric artery runs on the outer or iliac side of the neck of the sac, and the spermatic cord along its external and posterior side, not directly behind it, as in oblique inguinal hernia.

SURGICAL ANATOMY OF FEMORAL HERNIA.

The dissection of the parts comprised in the anatomy of femoral hernia should be performed, if possible, upon a female subject free from fat. The subject should lie upon its back; a block is first placed under the pelvis, the thigh everted, and the knee slightly bent, and retained in this position. An incision should then be made from the anterior superior spinous process of the ilium along Poupart's ligament to the symphysis pubis; a second incision should be carried transversely across the thigh about six inches beneath the preceding; and these are to be connected together by a vertical one carried along the inner side of the thigh. These several incisions should divide merely the integument; this is to be reflected outwards, when the superficial fascia will be exposed.

The *superficial fascia* at the upper part of the thigh, consists of two layers between which are found the cutaneous vessels and nerves, and numerous lymphatic glands.

The superficial layer is a thick and dense cellulo-fibrous membrane, in the meshes of which is found a considerable amount of adipose tissue, varying in quantity in different subjects; this layer may be traced upwards over Poupart's ligament to be continuous with the superficial fascia of the abdomen; whilst below, and on the inner and outer sides of the limb, it is continuous with the superficial fascia covering the rest of the thigh.

This layer should be detached by dividing it across in the same direction as the external incisions; its removal will be facilitated by commencing at the lower and inner angle of the space, detaching it at first from the front of the internal saphenous vein, and dissecting it off from the anterior surface of that vessel and its branches; it should then be reflected outwards, in the same manner as the integument. The cutaneous vessels and nerves, and superficial inguinal glands are then exposed, lying upon the deep layer of the superficial fascia. These are the internal saphenous vein, and the superficial epigastric, superficial circumflexa ilii, and superficial external pudic vessels, as well as numerous lymphatics ascending with the saphenous vein to the inguinal glands.

The *internal saphenous vein* is a vessel of considerable size, which ascends obliquely upwards along the inner side of the thigh, below Poupart's ligament. It passes through the saphenous opening in the fascia lata to terminate in the femoral vein. This vessel is accompanied by numerous lymphatics, which return the lymph from the dorsum of the foot and inner side of the leg and thigh; they terminate in the inguinal glands, which surround the saphenous opening. Diverging from the same point are the superficial epigastric vessels, which run across Poupart's ligament, obliquely upwards and inwards, to the lower part of the abdomen: the superficial circumflexa ilii vessels, which pass obliquely outwards along Poupart's ligament to the crest of the ilium; and the superficial external pudic vessels, which pass inwards to the perineum and scrotum. These vessels supply the subcutaneous areolar tissue and the integument, and are accompanied by numerous lymphatic vessels, which return the lymph from the same parts to the inguinal glands.

The *superficial inguinal glands* are arranged in two groups, one of which is disposed above and parallel with Poupart's ligament, and the other below the ligament, surrounding the termination of the saphenous vein, and following (occasionally) the course of that vessel a short distance along the thigh. The upper chain receives the lymphatic vessels from the penis, scrotum, lower part

of the abdomen, perineum, and buttock; the lower chain receives the lymphatic vessels from the lower extremity.

The *nerves* supplying the integument of this region are derived from the ilio-inguinal, the genito-crural, and anterior crural. The ilio-inguinal nerve may be found on the inner side of the internal saphenous vein, the terminal branch of the genito-crural nerve outside the vein, and the middle and external cutaneous nerves more external.

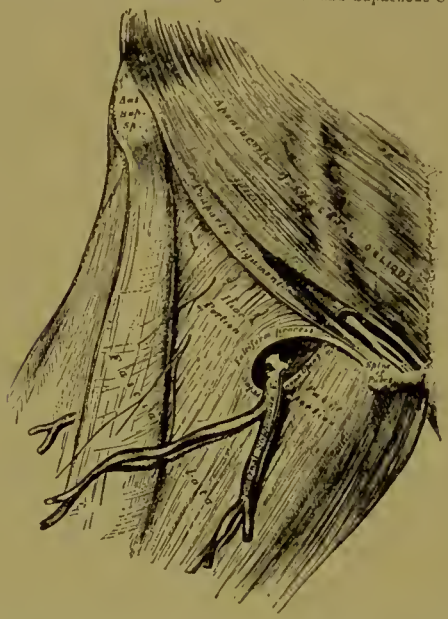
Fig. 449.—Femoral Hernia. Superficial Dissection.

The deep layer of superficial fascia should be divided in the same direction as the external incisions, and separated from the fascia lata; this is easily effected, from its extreme thinness. It is a thin but dense membrane, placed beneath the subcutaneous vessels and nerves, and upon the surface of the fascia lata. It is intimately adherent above to the lower margin of Poupart's ligament, and about one inch below this ligament covers the saphenous opening in the fascia lata, is closely united to its circumference, and is connected to the sheath of the femoral vessels corresponding to its under surface. The portion of fascia covering this aperture is perforated by the internal saphenous vein, and by numerous blood and lymphatic vessels; hence it has been termed the *cribriform fascia*, the openings of these vessels having been likened to the holes in a sieve. The cribriform fascia adheres closely both to the superficial fascia and the fascia lata, so that it is described by some anatomists as a part of the fascia lata, but is usually considered (as in this work) as belonging to the superficial fascia. It is not till the cribriform fascia has been cleared away, that the saphenous opening is seen, so that this opening does not, in ordinary cases,

exist naturally, but is the result of dissection. Mr. Callender, however, speaks of cases in which, probably as the result of pressure from enlarged inguinal glands, the fascia has become atrophied, and a saphenous opening exists independent of dissection.[1] A femoral hernia, in passing through the saphenous opening, receives the cribriform fascia as one of its coverings.

The deep layer of superficial fascia, together with the cribriform fascia, having been removed, the fascia lata is exposed.

Fig. 450.—Femoral Hernia, showing Fascia Lata and Saphenous Opening.



The *Fascia Lata*, already described, is a dense, fibrous aponeurosis, which forms a uniform investment for the whole of this region of the limb. At the upper and inner part of the thigh, a large oval-shaped aperture is observed in it; it transmits the internal saphenous vein and other small vessels, and is called the *saphenous opening*. In order the more correctly to consider the mode of formation of this aperture, the fascia lata in this part of the thigh is described as consisting of two portions, an iliac portion and a pubic portion.

The *iliac portion* of the fascia lata is situated on the outer side of the saphenous opening, covering the outer surface of the Sartorius, the Rectus, and the Psoas and Iliacus muscles. It is attached externally to the crest of the ilium and its anterior superior spine, to the whole length of Poupart's ligament as far internally as the spine of the pubes, and to the pectineal line in conjunction with Gimbernat's ligament, where it becomes continuous with the pubic portion. From the spine of the pubes, it is reflected downwards and outwards, forming an arched margin, the outer boundary (*superior cornu*) of the saphenous opening. This is sometimes called the *falciform process* of the fascia lata

[1] Anatomy of Femoral Rupture, note on p. 18.

(femoral ligament of Hey); it overlies, and is adherent to, the sheath of the femoral vessels beneath; to its edge is attached the cribriform fascia, and it is continuous below with the pubic portion of the fascia lata by a well-defined curved margin.

The *pubic portion* of the fascia lata is situated at the inner side of the saphenous opening: at the lower margin of this aperture, it is continuous with the iliac portion: traced upwards, it covers the surface of the Pectineus, Adductor Longus, and Gracilis muscles; and passing behind the sheath of the femoral vessels, to which it is closely united, is continuous with the sheath of the Psoas and Iliacus muscles, and is finally lost in the fibrous capsule of the hip-joint. This fascia is attached above to the pectineal line, and internally to the margin of the pubic arch. It may be observed from this description that the iliac portion of the fascia lata passes in front of the femoral vessels, the pubic portion behind them; an apparent aperture consequently exists between the two, through which the internal saphenous joins the femoral vein.

The *Saphenous Opening* is an oval-shaped aperture, measuring about an inch and a half in length, and half an inch in width. It is situated at the upper and inner part of the thigh, below Poupart's ligament, towards the inner side, and is directed obliquely downwards and outwards.

Its *outer margin* is of a semilunar form, thin, strong, sharply-defined, and lies on a plane considerably anterior to the inner margin. If this edge is traced upwards, it will be seen to form a curved elongated process or cornu (the superior cornu), or *falciform process of Burns*, which ascends in front of the femoral vessels, and curving inwards, is attached to Poupart's ligament and to the spine of the pubes and pectineal line, where it is continuous with the pubic portion.[1] If traced downwards, it is found continuous with another curved margin, the concavity of which is directed upwards and inwards; this is the inferior cornu of the saphenous opening, and is blended with the pubic portion of the fascia lata covering the Pectineus muscle.

The *inner boundary* of the opening is on a plane posterior to the outer margin, and behind the level of the femoral vessels; it is much less prominent and defined than the outer, from being stretched over the subjacent Pectineus muscle. It is through the saphenous opening that a femoral hernia passes after descending along the crural canal.

If the finger is introduced into the saphenous opening while the limb is moved in different directions, the aperture will be found to be greatly constricted on extending the limb, or rotating it outwards, and to be relaxed on flexing the limb and inverting it: hence the necessity of placing the limb in the latter position in employing the taxis for the reduction of a femoral hernia.

The iliac portion of the fascia lata, together with its falciform process, should now be removed, by detaching it from the lower margin of Poupart's ligament, carefully dissecting it from the subjacent structures, and turning it aside when the sheath of the femoral vessels is exposed descending beneath Poupart's ligament (Fig. 451).

The *Crural Arch*, or *Poupart's Ligament*, is the lower border of the aponeurosis of the External Oblique muscle, which stretches across from the anterior

[1] It is difficult to perceive in the recognized description of these ligaments (Hey's and Burns's), any difference between the two; nor is it clear what structure Mr. Hey really intended to describe. Mr. Gay (on "*Femoral Rupture*," p. 16) gives very cogent reasons for thinking that the "deep crural arch" was the structure which Hey had in view. The most recent writer on Femoral Hernia speaks thus while treating of these parts: "The whole upper edge of the iliac fascia lata is commonly called the 'falciform process,' whilst its deeper fibres receive the name of 'Burns's ligament.' Hey's femoral ligament would appear to consist of distinct fibres connected with the inner fold of the iliac fascia, which extend immediately beneath the tendon of the external oblique to the subperitoneal fascia." (Callender, "*On the Anatomy of the Parts Concerned in Femoral Rupture*," p. 19, note.) This description of Hey's ligament accords closely with that of the deep crural arch, for the subperitoneal fascia is Mr. Callender's name for the fascia transversalis. Mr Callender goes on to say, "The upper border of this (saphenous) opening thus receives, by an unfortunate complication the names of 'Falciform process,' 'Femoral ligament,' 'Burns's or Hey's ligament.' The various divisions of the iliac fascia lata depend to great measure upon the skill of the dissector, and are, in my opinion, artificial."

superior spine of the ilium, to the spine of the os pubis and pectineal line: the portion corresponding to the latter insertion is called *Gimbernat's ligament*. The direction of Poupart's ligament is curved downwards towards the thigh; its outer half being oblique, its inner half nearly horizontal. Nearly the whole

Fig. 451.—Femoral Hernia. Iliac Portion of Fascia Lata removed, and Sheath of Femoral Vessels and Femoral Canal exposed.

of the space included between the crural arch and innominate bone is filled by the parts which descend from the abdomen into the thigh. The outer half of the space is occupied by the Iliacus and Psoas muscles, together with the external cutaneous and anterior crural nerves. The pubic side of the space is occupied by the femoral vessels included in their sheath, a small oval-shaped interval existing between the femoral vein and the inner wall of the sheath, which is occupied merely by a little loose areolar tissue, and occasionally by a small lymphatic gland; this is the crural canal, along which the gut descends in femoral hernia.

Gimbernat's Ligament (Fig. 452) is that part of the aponeurosis of the External Oblique muscle which is reflected downwards and outwards, to be inserted into the pectineal line of the os pubis. It is about an inch in length, larger in the male than in the female, almost horizontal in direction in the erect posture and of a triangular form, the base directed outwards. Its *base*, or outer margin, is concave, thin and sharp, lies in contact with the crural sheath, and is blended with the pubic portion of the fascia lata. Its *apex* corresponds to the spine of the pubes. Its *posterior margin* is attached to the pectineal line. Its *anterior margin* is continuous with Poupart's ligament.

Crural Sheath. If Poupart's ligament is divided, the femoral or crural sheath may be demonstrated as a continuation downwards of the fascia that line the

abdomen, the transversalis fascia passing down in front of the femoral vessels, and the iliac fascia descending behind them; these fasciæ are directly continuous on the iliac side of the femoral artery, but a small space exists between the femoral vein and the point where they are continuous on the pubic side of that vessel which constitutes the femoral or crural canal. The femoral sheath is closely adherent to the contained vessels about an inch below the saphenous opening, becoming blended with the areolar sheath of the vessels, but opposite Poupart's ligament it is much larger than is required to contain them; hence the funnel-shaped form which it presents. The outer border of the sheath is perforated by the genito-crural nerve. Its inner border is pierced by the internal saphenous vein, and numerous lymphatic vessels. In front, it is covered by the iliac portion of the fascia lata; and behind it is the pubic portion of the same fascia.

Deep Crural Arch. Passing across the front of the crural sheath, and closely connected with it, is a thickened band of fibres, called the *deep crural arch.* It is apparently a thickening of the fascia transversalis, joining externally to the centre of Poupart's ligament, and arching across the front of the crural sheath, to be inserted by a broad attachment into the pectineal line, behind the conjoined tendon. In some subjects, this structure is not very prominently marked, and not unfrequently it is altogether wanting.

If the anterior wall of the sheath is removed, the femoral artery and vein are seen lying side by side, a thin septum separating the two vessels, and another septum separates the vein from the inner wall of the sheath. The septa are stretched between the anterior and posterior walls of the sheath, so that each vessel is inclosed in a separate compartment. The interval left between the vein and the inner wall of the sheath is not filled up by any structure, excepting a little loose areolar tissue, a few lymphatic vessels, and occasionally a lymphatic gland; this is the femoral or crural canal, through which a portion of intestine descends in femoral hernia.

The *crural canal* is the narrow interval between the femoral vein and the inner wall of the crural sheath. It exists as a distinct canal only when the sheath has been separated from the vein by dissection, or by the pressure of a hernia or tumor. Its length is from a quarter to half an inch, and it extends from Gimbernat's ligament to the upper part of the saphenous opening.

Its *anterior wall* is very narrow, and formed by the fascia transversalis, Poupart's ligament, and the falciform process of the fascia lata.

Its *posterior wall* is formed by the iliac fascia and the pubic portion of the fascia lata.

Its *outer wall* is formed by the fibrous septum covering the inner side of the femoral vein.

Its *inner wall* is formed by the junction of the transversalis and iliac fasciæ, which forms the inner side of the femoral sheath, and covers the outer edge of Gimbernat's ligament.

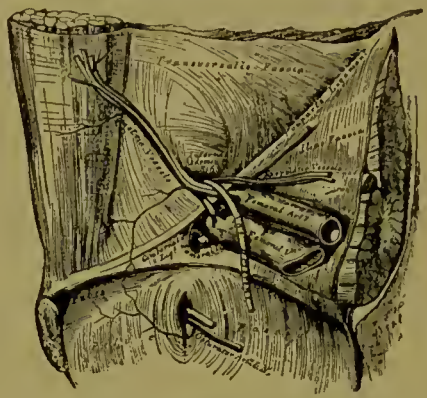
This canal has two orifices: a lower one, the *saphenous opening*, closed by the cribriform fascia; an upper one, the *femoral* or *crural ring*, closed by the septum crurale.

The *femoral* or *crural ring* (Fig. 452) is the upper opening of the femoral canal, and leads into the cavity of the abdomen.[1] It is bounded in front by Poupart's ligament and the deep crural arch; behind by the pubes, covered by the Pectineus muscle, and the pubic portion of the fascia lata; internally, by Gimbernat's ligament, the conjoined tendon, the transversalis fascia, and the deep crural arch; externally, by the femoral vein, covered by its sheath. The femoral ring is of an oval form, its long diameter, directed transversely, mea-

[1] This ring, like the crural canal, is a morbid or an artificial product. "Each femoral hernia makes for itself (for neither outlet exists in the natural anatomy of the region) a crural canal, and a crural (femoral) ring."—Callender, *op. cit.*, p. 40.

sures about half an inch, and it is larger in the female than in the male, which is one of the reasons of the greater frequency of femoral hernia in the former sex.

Fig. 452.—Hernia. The Relations of the Femoral and Internal Abdominal Rings, seen from within the Abdomen. Right Side.



Position of Parts around the Ring. The spermatic cord in the male, and round ligament in the female, lie immediately above the anterior margin of the femoral ring, and may be divided in an operation for femoral hernia if the incision for the relief of the stricture is not of limited extent. In the female, this is of little importance, but in the male the spermatic artery and vas deferens may be divided.

The *femoral vein* lies on the outer side of the ring.

The *epigastric artery*, in its passage inwards from the external iliac to the umbilicus, passes across the upper and outer angle of the crural ring, and is consequently in danger of being wounded if the stricture is divided in a direction upwards and outwards

The *communicating branch* between the epigastric and obturator lies in front of the ring.

The circumference of the ring is thus seen to be bounded by vessels in every part excepting internally and behind. It is in the former position that the stricture is divided in cases of strangulated femoral hernia.

The *obturator artery*, when it arises by a common trunk with the epigastric, which occurs once in every three subjects and a half, bears a very important relation to the crural ring. In some cases (Fig. 453), it descends on the inner side of the external iliac vein to the obturator foramen, and will consequently lie on the outer side of the crural ring, where there is no danger of its being wounded in the operation for dividing the stricture in femoral hernia. Occasionally, however, the obturator artery curves along the free margin of Gimbernat's ligament in its passage to the obturator foramen; it would, consequently, skirt along the greater part of the circumference of the crural canal, and could hardly avoid being wounded in the operation (Fig. 454).

Septum Crurale. The femoral ring is closed by a layer of condensed areolar tissue, called, by J. Cloquet, the *septum crurale*. This serves as a barrier to the protrusion of a hernia through this part. Its upper surface is slightly concave, and supports a small lymphatic gland, by which it is separated from the subserous areolar tissue and peritoneum. Its under surface is turned towards the

femoral canal. The septum crurale is perforated by numerous apertures for the passage of lymphatic vessels, connecting the deep inguinal glands with those surrounding the external iliac artery.

Variations in Origin and Course of Obturator Artery.

Fig. 453.

Fig. 454.

The size of the femoral canal, the degree of tension of its orifices, and, consequently, the degree of constriction of a hernia, varies according to the position of the limb. If the leg and thigh are extended, abducted, or everted, the femoral canal and its orifices are rendered tense, from the traction on these parts by Poupart's ligament and the fascia lata, as may be ascertained by passing the finger along the canal. If, on the contrary, the thigh is flexed upon the pelvis, and, at the same time, adducted and rotated inwards, the femoral canal and its orifices become considerably relaxed; for this reason, the limb should always be placed in the latter position when the application of the taxis is made in attempting the reduction of a femoral hernia.

The septum crurale is separated from the peritoneum by a quantity of loose subserous areolar tissue. In some subjects, this tissue contains a considerable amount of adipose substance, which, when protruded forwards in front of the sac of a femoral hernia, may be mistaken for a portion of omentum.

Descent of the Hernia. From the preceding description it follows, that the femoral ring must be a weak point in the abdominal wall; hence it is, that when violent or long-continued pressure is made upon the abdominal viscera, a portion of intestine may be forced into it, constituting a femoral hernia; and the changes in the tissues of the abdomen which are produced by pregnancy, together with the larger size of this aperture in the female, serve to explain the frequency of this form of hernia in women.

When a portion of intestine is forced through the femoral ring, it carries before it a pouch of peritoneum, which forms what is called the *hernial sac;* it receives an investment from the subserous areolar tissue, and from the septum crurale, and descends vertically along the crural canal in the inner compartment of the sheath of the femoral vessels as far as the saphenous opening: at this point, it changes its course, being prevented from extending further down the sheath, on account of the narrowing of the sheath and its close contact with the vessels, and also from the close attachment of the superficial fascia and crural sheath to the lower part of the circumference of the saphenous opening; the tumor is, consequently, directed forwards, pushing before it the cribriform fascia, and then curves upwards on to the falciform process of the fascia lata and lower part of the tendon of the External Oblique, being covered by the superficial fascia and integument. While the hernia is contained in the femoral canal, it is usually of small size, owing to the resisting nature of the surrounding parts; but when it has escaped from the saphenous opening into the loose areolar tissue of the groin, it becomes considerably enlarged. The direction taken by a femoral hernia in its descent is at first downwards, then forwards and upwards; this should be borne in mind, as in the application of the taxis for the reduction of a femoral hernia, pressure should be directed in the reverse order.

Coverings of the Hernia. The coverings of a femoral hernia from within out-

wards are peritoneum, subserous areolar tissue, the septum crurale, crural sheath, cribriform fascia, superficial fascia, and integument.[1]

Varieties of Femoral Hernia. If the intestine descends along the femoral canal only as far as the saphenous opening, and does not escape from this aperture, it is called *incomplete femoral hernia.* The small size of the protrusion in this form of hernia, on account of the firm and resisting nature of the canal in which it is contained, renders it an exceedingly dangerous variety of the disease, from the extreme difficulty of detecting the existence of the swelling, especially in corpulent subjects. The coverings of an incomplete femoral hernia would be, from without inwards, integument, superficial fascia, falciform process of fascia lata, fascia propria, septum crurale, subserous cellular tissue, and peritoneum. When, however, the hernial tumor protrudes through the saphenous opening, and directs itself forwards and upwards, it forms a *complete femoral hernia.* Occasionally, the hernial sac descends on the iliac side of the femoral vessels, or in front of these vessels, or even sometimes behind them

The *seat of stricture* of a femoral hernia varies: it may be in the peritoneum at the neck of the hernial sac; in the greater number of cases it would appear to be at the point of junction of the falciform process of the fascia lata with the lunated edge of Gimbernat's ligament; or at the margin of the saphenous opening in the thigh. The stricture should in every case be divided in a direction upwards and inwards; and the extent necessary in the majority of cases is about two or three lines. By these means, all vessels or other structures of importance, in relation with the neck of the hernial sac, will be avoided.

[1] Sir A. Cooper has described an investment for femoral hernia under the name of "Fascia propria," lying immediately external to the peritoneal sac, but frequently separated from it by more or less adipose tissue. Surgically, it is important to remember the existence (at any rate the occasional existence) of this layer, on account of the ease with which an inexperienced operator may mistake the fascia for the peritoneal sac, and the contained fat for omentum. Anatomically, this fascia appears to be identical with what is called in the text "subserous areolar tissue," the areolar tissue being thickened and caused to assume a membranous appearance, by the pressure of the hernia.

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